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Indian Institute of Public Administration

Governmental Management and Organisation in the Scientific Age.

Prof. J.B. Westcott
Visiting Professor, I.I.P.A.

The problems of administrative improvement in India are larger and more complex than in nearly every other country in the world. First, there is the matter of sheer size and diversity of population. 45 crores of (450 million) people, most of them still illiterate, are participants in the present great Indian effort for self-improvement. They speak many different languages; they are separated by great distances and inadequate transportation links; they hold many different religious beliefs; many of them suffer from inadequate food; the environment dooms many to early death; and the strong forces of tradition and habit enforce the continuation of practices which are no longer pertinent to contemporary reality.

In spite of many handicaps, the people of India are making progress in their struggles to improve the general welfare. In their efforts, they are immeasurably aided by the great inventions of the Industrial

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Revolution. But in the future they will be more benefitted by new research discoveries of the "Scientific Age" into which civilization is now evolving.

The changes in the material welfare of mankind have been larger during the past two centuries of the Industrial Revolution than in all previous recorded history. But the improvements which will be generally available to mankind in the next forty years will far surpass all those of the past two hundred years; and the main burden for transferring scientific discoveries into large activities for the benefit of the world's citizens will fall heavily on the shoulders of administrators - both those in government and those who will be leading the great industrial, commercial, agricultural, and educational institutions of the world.

The main themes of this essay are the great scientific discoveries which are now increasing so rapidly in all parts of the world and the large problems of management and organisation which are being created by these discoveries. The following essay on "The Audit of Performance" deals specifically with the kinds of action leaders must take to improve

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the general levels of administration in order to equip their nations to gain maximum benefit from these great new discoveries.

A. DEFINITIONS

It may be useful here to advance a definition of the words "management" and "organisation". Unfortunately the literature on public administration suffers from lack of precision in the meaning of words. Aside from differences in meanings between countries, it is impossible to obtain consensus in any one country. The word "management" is an example; in one unpublished American dictionary on public administration, the author lists 41 definitions of the word.

For the purposes of this essay, "management" is defined as the responsibility for (a) participation in the formulation of policies and goals, and (b) participation in directing the activities of people toward achieving policy objectives and goals. Within this definition fall the responsibilities of prime ministers, presidents, cabinet ministers, secretaries, department heads, division chiefs, and section heads. Their total responsibility is to formulate policies

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and to do their best to see that the total activity of organisations achieve the policy objectives.

"Organisation" is defined as two or more people (or entities) who combine to try to achieve one or more objectives.

In both India and the United States there is much popular distrust of government dating back to the times before independence when the British were rather benevolent, but very much unappreciated rulers. One of the American "founding fathers", Thomas Jefferson, observed "that government is best which governs least". In the American popular mind, governmental service has traditionally been associated with political spoils, or at best, service which sincere but mediocre persons could perform. And in India today, it is rumoured that much of the public service excepting in the upper levels, is having some problems in competing with commerce and industry for able young men.

The cult of belief that government service is intrinsically and irretrievably inefficient has been strengthened in recent years by a delightfully humorous essay - "Parkinson's Law":

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"work expands so as to fill the time available for its completion".

".....it now becomes possible to state Parkinson's Law in mathematical form. In any public administrative department not actually at war the staff increase ... will invarially prove to be between 5.17 per cent and 6.56 per cent, irrespective of any variation in the amount of work (if any) to be done".

This "law" which was conceived by a professor of history vacationing on a seashore beach in Thailand, seems to have captured the imagination of people the world over. Administrators who have heard there is such a "law" but haven't read it, wonder what great wisdom they are missing. Although seasoned administrators recognise this so-called "law" as a fraud, a surprising number of people who should know better are misled by this bit of nonsense. (Even libraries classify the essay under "administration" instead of "humor").

The truth is that in many countries including India and the United States, government has been getting better as it has become bigger. The number of professionally trained officials and skilled career employees in government has been growing rapidly; and their ethical standards and devotion to the public service seem to be improving with each decade.

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While it is true that many governmental organisations are characterized by delay and general inefficiency, it is equally true in both India and the United States, that the best governmental organisations are as efficient and effective as the best private organisations in the world. An overriding problem in both countries is to improve the general efficiency of all of the public service so it approximates the quality of the best organisations.

Improvement in organisations is first and foremost a matter of applied common sense; much of life itself consists of the continual effort of individuals to improve their environment and even themselves. But administrative improvement in the modern world involves something more than the ordinary common sense of the average untrained person.

In modern complex organisation, specialised knowledge plus common sense are required to achieve desirable improvements. Therefore people who have specialised in the problems of organisation, management procedures and methods are hired by large organisations to assist in rationalizing and simplifying activities. Indeed "Organisation and Management" (O & M) work is

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so specialised that in many places analysts become expert in only one or two aspects of administrative improvement — for example, in fiscal management, personnel management, records management, traffic management, chemical laboratory management or dental management. There are methods specialists who concentrate exclusively on visiting dental offices instructing dentists in the newest techniques for repairing teeth. In a field in which new equipment and methods have enabled dentists to double their productivity in the past decade, O & M in the field of dentistry is a small but highly profitable business; for no good dentist can afford to neglect training in the newest techniques.

In the highest sense, the analysis of management and organisation is much more than the improvement of methods and procedures. It is also the careful analysis of the structure and distribution of authority at the top levels of organisations. The best known O & M person in the United States is ex-President Herbert Hoover, who devoted five years of his life between 1947 and 1957 in leading two major studies on the Reorganisation of the Executive Branch of the Federal Government. A

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three foot bookshelf of Hoover Commission reports was prepared and presented to the American national parliament and over 400 major recommendations for improvement were put into effect.

B. ESSENTIAL CONDITIONS FOR RAPID IMPROVEMENT OF ADMINISTRATION

There are a number of conditions which are essential to the rapid improvement of administration. A tentative list of these conditions or "axioms" for the ideally effective organisation are presented herewith.

1. Responsibility for efficiency and effectiveness -

In each ministry, department, division, office, section, development agency and company the top person assumes active responsibility for the efficiency and effectiveness of his organisation. Even for the highest officials, this means they must give some personal time and attention to the operational, procedural, and morale problems of their organisations.

2. Administrative ethics - The top person in each organisation unit assumes personal responsibility for inspiring the employees about the importance of the work of the organisation and for assuring that each employee understands the significance of his own efforts. Each administrator and manager conducts himself in such a manner as to inspire the respect and confidence of those in his organisation.

3. Organisation and management staffs - In large organisations, staffs of full time specialists,

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in work improvement are maintained. The staffs are manned by people who possess these qualities: resourcefulness, energy, patience, tact, basic humility, and special skill in the techniques of O & M. In small organisations not having access to O & M staffs, leadership sponsors a continuing effort in organisational self-improvement, using published standards of quality and quantity as a means of determining satisfactory levels of productivity.

4. Operational goals - Reasonably attainable operating goals are established, including quantity and quality goals for the organisation as a whole and for each unit within the organisation.

5. Individual responsibilities - Reasonable standards of performance for each employee are maintained, including standards for both quantity and quality of work performed.

6. Operating reports - A system of periodic, prompt operating reports is maintained which compares actual production results with planned performance; it also compares the organisation's activities with the activities of similar organisations.

7. Employee participation ("participative management") - At each level in the organisation, leadership makes sure that the employees participate in the establishment of goals and standards, in the review and evaluation of performance, and in planning for eliminating weaknesses.

8. Opinions of those served by the organisation - At frequent intervals, appraisal is made of the opinions of those who are served by the organisation, including analyses of patterns of complaints.

9. Continual corrective action - Modifications are continually made to maximise effectiveness, including - as the case may require - revision in goals, increase or decrease in number of employees, and in-service training to reduce weaknesses and to prepare employees for changed or new responsibilities.

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10. Productivity improvement - There is a special continuing effort throughout the organisation designed to improve the organisation's productivity by several percentage points each year.

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These conditions for efficiency and effectiveness are easy to enumerate but exceedingly difficult to achieve. Doubtless no organisation in the world comes close to fulfilling all of them; and most organisations do very poorly indeed. One main problem is that an insufficient amount of time is devoted to systematic improvement efforts. Sixty years ago the "father of scientific management" — Frederick Taylor — observed that not less than one employee in seven should be engaged in the constructive work of planning, controlling, and improving organisations. With the greater complexity of contemporary administration, at least one fifth of the total time of employees should be devoted to such work, and in some organisations perhaps the figure should be as high as one half.

C. THE VISION OF FUTURE LARGE SCALE INNOVATION

Levels of organisational effectiveness :-

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as close as possible to the ten conditions discussed above provide essential organisational structure to reap maximum benefits for mankind which the New Revolution in Science is going to make attainable. Unless modern organisations are efficient and flexible in adapting to the needed rapid change, they will not be able to cope with the new, more difficult problems which will face society in every country during the next two or three decades.

The enormous number of new scientific discoveries which will be available for general use by 1970 or 1980 will be much larger than society can absorb. An impression of the size of the New Scientific Revolution may be gained from the following figures. During the century and one half from 1790 to 1940 in the United States the following inventions helped to revolutionize life: the cotton gin, the spinning jenny, the steam engine (railroads and steamships), the telegraph, the telephone, the incandescent light, the radio, the bicycle, the automobile, the airplane; and in medicine, anesthesia, innoculation to prevent communicable disease, and general surgery. The

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estimated total expenditures for scientific research and development in the United States during this 150 year period by such scientists and inventors as Alexander Graham Bell, Thomas Edison, Henry Ford, the Wright Brothers and thousands of others were 800 crores of dollars (eight billion dollars). In the one year 1962, nearly twice this amount will be spent in the United States for research and development and in the decade 1961-70 an estimated 20,000 crores of dollars (200 billion dollars) will be expended. This represents an average annual expenditure in this decade of 375 times the average in the first 150 years of United States history.

Although the average of annual expenditures for science from 1950-1960 was far below present levels, the phenomenal number of discoveries during the past decade staggers the imagination. Among the hundreds of recent and probable near-term future kinds of discoveries of vital concern to society and to governmental administrators are the following:

1. Practical uses for the world's plentiful resources - The discovery of new chemical processes and physical properties are opening up possibilities for the use

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of plentiful resources to be used as substitutes for materials which are in scare supply. The uses of sand for plastics and for heat-proof glass, and the use of lignite in place of iron ore are examples. Automobile bodies of plastic instead of sheet steel, and engines of aluminimum instead of iron are further illustrations of this trend.

2. Sea Mining for food and minerals - The untapped and virtually inexhaustable food resources in the waters of the oceans, and the enormous amounts of gold and other valuable minerals will add immensely to the world's food supply and general wealth when economical ways are found to exploit these vast bodies of water. With the expected doubling of world's population -- from 300 crore (3 billion) in 1962 to 600 crore (6 billion) before the year 2,000 -- these oceanic supplies, along with other new sources of food will be sorely needed to prevent mass hunger and starvation.

3. Weather control - Since the launching of the world's first weather satellite in 1960, meteorologists have added far more to their total knowledge of the world's weather than in all previous history to that date. The present weather control experiments of Americans, Russians and others may well produce new methods which will enable men to reduce floods by reducing rainfall in some areas, and makes deserts bloom through artificial redirection of moisture-laden clouds and stimulation of precipitation in other designated areas. The large number of highly skilled scientists now working on weather control suggests that these efforts are not the work of mere dreamers.

4. Bio-chemical generation of electrical power - There may be near-term hope for generation of electricity in small containers of water, containing a special mixture of vegetable or animal materials. On March 5, 1962 the New Delhi Statesman reported a laboratory research project in which electricity is being produced from the contents of a test tube seven inches long. Apparently there is hope that practical

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uses of this discovery may become available. It is said that this source of electric power may be cheaper and easier to generate in many places than hydro-electric, steam-generated, and atomic power. If so, it could be of enormous benefit in many communities throughout the world.

5. Health - Although dramatic improvements have been made in all branches of medicine and public health, even more improvements are coming. Cures for people ill with the two great killers - cancer and cardio-vasular diseases - will doubtless increase well above their present already encouraging levels. Inexpensive, easy-to-take medicines, many of them in handy pill form, will increase in numbers and be more widely available to all the people of the world. Thus the general health and vigor of humanity should improve.

6. Microminiaturization - The mass production of useful products - such as radios smaller than a transistor radio - will become common within ten years; and their reliability against deterioration, weathering, and breakage will be higher than the larger sizes of equipment which now serve the same purposes. The smaller quantity of materials needed will reduce production costs and conserve sources of supply. With the savings from mass production, the lower costs should bring many present "luxury" products within the purchasing power of the tens of millions of people. The large markets for the new products will provide jobs for millions of people.

7. Electronics - One great advantage of electronic devices is that there are either no moving parts or few moving parts. There is little or no friction, so the products last much longer than were motors or engines are used. With the addition of highly reliable components such as transistors and microscopically small solids, the basis exists for useful products which hardly wear out or need repair. The electronic refrigerators, heaters, coolers, and stoves -- possibly powered by chemical energy or solar energy.

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8. "Bionics" - Research in "bionics" is one of the more fascinating and potentially most useful subjects for administrators. Bionics is a "coined" word which combines "biology" with "electronics". Bionics research is the study of the electronic systems in human and animal organisms which drive and control the bodies of men, beasts, reptiles, fish, and insects. These "closed circuit" systems of bodily control are a thousand or a million times more efficient than the best organisational and mechanical systems yet devised by man in his control of government, business, and society. To the extent scientists can learn more about highly efficient systems created by God (i.e. systems freely existent in nature) mankind may be able to copy part of them, with infinite benefits to itself. Consider for example, the electronic computer. One of the most complex computers in the world cost 8.5 crores of rupees to build (17.5 million dollars) and is housed in a massive air conditioned building which cost an additional 18 crores of rupees (35 million dollars). Where this expensive computer has perhaps a crore (10 million) of parts. The human brain has 1,000 crores (10 billion) of components. The 1,000 crore units of the human brain are said to produce 500 crores of electrical impulses every second of one's life "in response to information flowing into the nervous system ... or in response to nothing in particular, emitting signals spontaneously"*. By contrast, the electronic computer is housed in a space many hundreds of times the size of the human brain. Although the computer is highly reliable, very fast, and very useful, it is simple and an "idiot" when compared with the human brain. When scientists and administrators are able to adapt into their work procedures even a small fraction of the efficiency which exists all around us in nature, the improvements in industry, government and society will be fantastically large and beneficial.

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* Fortune Magazine, October, 1961, page 148 (part of a science article, "Problems, too, Have Problems", beginning on page 144).

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9. Communication (radio, television, telephone) - The kinds of research referred to above indicate that simpler and less expensive means of long distance and short distance communication will be available soon. This will include cheaper and much more efficient world-wide telephone service and worldwide access to human events through radio and television. One should be able to sit in his home in India and watch great events occurring in other parts of the world. He may be able to telephone his friends in any other country as easily as calling anyone in his same city.

10. Education - Among the largest group of beneficiaries from the Scientific Revolution may be the hundreds of millions of childrenn throughout the world who may, for the first time, have the opportunity to obtain an education. With the world-wide production of economical and reliable televisions sets, children in the most remote areas may have the opportunity to see, hear and learn the most talented teachers using the best of laboratory equipment and visual aids.

11. Other "gifts of the scientist" - In addition to these discoveries, a number of others of special importance to the villages and cities of India deserve mention. They include; photosynthesis, synthetic food, economical purification of brackish and salt water, wind energy utilisation, and automation.

D. CAPITILIZING ON THE SCIENTIFIC REVOLUTION - THE ROLE OF GOVERNMENTAL AND BUSINESS ADMINISTRATORS

To assure that the benefits of the Scientific Revolution will be exploited for the human welfare, the political, administrative, and educational leaders of society will have to make large decisions of great significance to mankind.

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New, practical inventions are being produced at such a fast rate, that great national decisions will have to be made on what desirable improvements will be attempted and which will be postponed or discarded; for society can absorb only a limited amount of innovation at any time.

1. Political level considerations.

At least two political level considerations will have to be faced in any country:

> First, the role in society of scientists and technical specialists is going to have to be carefully reconsidered. On the one hand there is danger that their usefulness may be restricted by un-enlightened political and administrative leadership. On the other hand, there is danger that as they gain prestige from their practical inventions, their influence over non-scientific affairs may become far too large for the good of society.
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> Second, the resolution of great political, economic, and organisational problems is going to have to be made on the merits of the facts of life in the last half of the twentieth century. National decisions heavily influenced by such obsolete terminology as "socialism", "capitalism", and "communism" - with their attendent biases and emotional appeals - are going to have to give way to decisions based on concepts of society which reflect the realities of modern life.

2. Administrative considerations.

In administration, new concepts of authority,

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new methods of decision-making and new procedures for achieving results will need to be adopted by governments and by organisations in both the public sector and the private sector. A major portion of the next essay -- "The Audit of Performance" -- is devoted to a detailed consideration of these concepts. At this point, however, attention is directed to the startling effects which only the invention -- the electronic computer -- is having on administrative organisation and management.

There are many people who believe computers will not be used very much in south Asia in the near future, especially not as devices to improve administration. Recent experience in both the western world and in India suggest that this viewpoint is incorrect. In the United States, for example, the first commercial digital computer was installed by the government in 1951; and it was not until 1955 or 1956 that the utility of the computer in administration came to be understood by many people. But by 1960, the American national government alone had over 500 digital computers in operation and many others on order. This change is only a beginning, but already a revolution in

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administration has taken place from the top to the bottom of many organisations.

In India, a beginning in the use of computers has already been made. Although the present small number are mostly used in scientific and statistical work, some of them are adaptable to administration. The larger number which are now on order will further increase Indian capabilities in this new field. The number of Indian officials, both in business and government, who are well qualified to apply "computer technology" to administration is growing rapidly; and it is probable that by 1970 or before, the new techniques will be in rather widespread use. Benefits which will accrue to Indian society may be estimated from the following examples from recent American experience.

a). Top level administrative decisions - The head of a large ministry must make a decision on the purchase of expensive machinery costing several crores of dollars. Several similar types of machinery are available, and the minister needs precise information on which type is the best. Ministry officials who are specialists in the machinery, in finance, and in statistics study the each alternative type of equipment from many points of view including:

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1. Initial cost
2. Useful lifetime
3. Cost of maintenance during lifetime
4. Types, number and cost of manpower required to operate it during its lifetime
5. Comparative level of performance (value analysis).

If the statistician had many years of time, he could possibly work out solutions to these variables with pen and paper. But a recommendation is needed within a few hours or days. The electronic computer, with its great capacity and speed in handling mathematical problems can solve the algebraic equations a thousand times or a million times faster than man. It is also much more accurate. With the precise information before him, the minister is able to make a far better decision than otherwise.

b). Size of industrial plants - A few years ago one of the world's most successful electrical corporations built a new, modern plant with an assembly line a mile long. It reflected the thinking of the industry's best architects and engineers. One or two years later a newly formed group of "operations research" analysts made a study of the overall efficiency of the new plant. They proved that the product could have been produced with an assembly line one fourth the length which had been set up, with capital savings of millions of dollars. The president of the corporation then decided that no more buildings would be constructed until operations research analysts had reviewed the plans.

c). Control of capital construction budgets - A large electrical utility company serving several million customers must add new generating plants at frequent intervals to meet the power requirements of a rapidly growing population. A small staff of employees operate an analogue computer to determine the most economical location and the most economical time to build each plant and the connecting power lines. The greater precision in the use of materials and manpower saves millions of dollars a year in costs.

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d). Location of manufacturing plants - A university graduate student was asked to solve the following problem. Should an electrical company with a growing market build a new plant near its new large market, or should it expand its old plant 1,000 miles away. The graduate student compared land values, taxes, weather, skilled manpower availability, prevailing wages, and other variable factors in the two locations. With the use of a small computer he solved the linear algebraic equations. He concluded that it would be less costly to expand at the home plant, even though the transportation costs would be higher.

Unfortunately, the company had built the new plant in the expanding market area several years before computer planning was available. After the plant was in operation the cost accountants learned that the new plant was much less economical than the parent plant.

e). Inventory control - A large national organisation stores thousands of component parts in warehouses throughout the country. For each component, thousands of items must be kept in storage to meet the needs of the customers. The company buys a computer for ten lakhs of dollars to keep its inventory records. The sales at each warehouse are telegraphed each night to the computer centre where the national totals are balanced against production. By studying the sales trends, the organisation is able to reduce inventory levels by several crores of dollars. Also, production is now geared precisely to requirements, with large savings in the amount of unused component parts. Total savings in a year amount to more than the total cost of the computer.

f). Manpower Utilisation - A large national organisation hires several thousand new employees a year. It takes two weeks to match their individual skills against the national list of skill requirements. A computer is purchased, and each evening the skills of the hundreds of new employees is telegraphed to the computer centre to be matched against the skill needs.

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By the next morning, the matching is completed and each man is assigned to work at a place where his special abilities can be best utilised. The two weeks saving on each of the new employees amounts to many lakhs of dollars each year.

g). Payrolling - In a small organisation with 4,000 employees, approximately 12,000 pay cheques are written each month. One typist using a semi-automatic electronic payroll machine writes all the cheques. For each person she types the name, the address, the rate of pay, the number of hours, number of family dependents, and the total pay received so far this year. The machine computes the gross pay, the deductions for national income tax, the deductions for state income tax, the deductions for retirement, and the net pay due. It prints the net amount on a pay cheque which contains the employee's name and address. On an attached tab it prints all the data for the information of the employee.

The process is neat and accurate and the employee receives his cheque in the mail on the morning of the day it is due him. The payroll typist is able to handle about two cheques per minute. The machine automatically summarizes the taxes and retirement amounts, and the organisation pays these totals to the national and state governments. The system is many times as accurate as the older clerical methods of payrolling. So the amount of auditing is reduced to a fraction of that previously required.

h). Accounting - A small store with four lakhs of credit accounts has one full time bookkeeper to keep the records. She makes many clerical errors. The store hires a punch card service organisation to keep the accounts. The organisation receives half the amount of the bookkeeper's salary. Nearly all of the clerical errors are eliminated by the verifying system used in all punch card operations. Customers are better satisfied with the more accurate bills, and the sales of the store increase.

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These examples illustrate the fact that electronic equipment can make administration quicker, more accurate, and much less costly. This equipment does not, however, simplify the work of the administrator and his staff. Indeed, a substantially higher level of knowledge is required. The administrator or decision-maker need not be an expert in the mathematics or the engineering of computers. But he should have enough understanding of them so he will have a general knowledge of what his specialist staff are doing and the ways in which their skills can be useful to the organisation. As to the computer itself, it is only a complicated adding machine whose reliability is no greater than that of the people responsible for its use.

Fortunately, some of the benefits of computers can be obtained without having to buy or rent them. These benefits will be described in the next essay.

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3. Educational and training considerations - Education is the third large area for new national decisions in the age of the Scientific Revolution, if the benefits

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are to be properly exploited for mankind. Discussion here is limited to that small phase relating to public administration.

In spite of the rapid growth of the public sector in most countries, only insignificant attention has been devoted to educational and training programs for improving governmental administration. In many countries, including the India and the United States, the private sector has been doing a better job of training its administrators and employees than the public sector. Furthermore, the amount of business administration in the universities has been much larger and the average quality has probably been at least as good as that in public administration.

University education in public administration needs to be substantially modified and strengthened. Although this is true in both the United States and India, the following paragraphs deal only with India. Most Indian university education in public administration is modeled after American and British courses. Even the best of the foreign courses are prepared for the use of students living in their

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own cultures. The problems there are different from those in India; the theory and the organisational practices are different; and the meaning of the terminology is just enough different to misguide the novice. Forthe beginning Indian student in public administration it is possible that foreign books may do him as much or more harm than good. The need for more good Indian books on public administration is urgent in Indian universities. The ablest administrators and professors have an obligation to contribute to the Indian literature at a rate higher than at present.

A fundamental reconsideration of the course content of university educational programmes in public administration is needed. In the past, good administration was mainly a highly refined art developed primarily through practical experience. Contemporary administration is both an art and a science. At almost every level of administration, decision-making requires increasingly sophisticated combinations of technology, professional knowledge, aesthetic values, and wisdom. Excepting for wisdom, much of the other qualities are based on processes and concepts which are learned in rigorous educational

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and training programs. Therefore, university education for public administration needs to include a larger number of technical and professional papers to reinforce or replace some papers now required in the curricula. In planning these changes the advice of the ablest governmental administrators needs to be sought. From the combined efforts of univeristy professors and governmental administrators there should come educational programs that substantially improve the capacities of youthful graduates to deal with the newer and more difficult problems of administration in the Scientific Age.

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